Tuning Absorption and Emission Spectra of Glass Using Bimetallic Copper Oxide and Titanium Dioxide Nanoparticles

Asmahani Awang, Ms

Industrial Physics Programme, Faculty of Science and Technology, Universiti Malaysia Sabah, Jalan UMS, 88400 Kota Kinabalu, Sabah, Malaysia

Abstract:

This study investigates modifications to the absorption features of glass by incorporating varying concentrations of bimetallic copper oxide (CuO) and titanium dioxide (TiO_2) nanoparticles in the glass matrix. A series of glasses with composition of $(70-x-y)TeO_2-20ZnO-9Na_2O-1Er_2O_3-(x)CuO-(y)TiO_2$, where x = 0.00 and 0.10 mol%; y = 0.00, 0.04, and 0.10 mol% were fabricated using a melt-quenching technique. Different characterizations were demonstrated, including absorption and emission features, using Ultraviolet-visible spectroscopy and Photoluminescence spectroscopy. The plasmon peak and emission features of glass vary with the incorporation of different concentrations of CuO and TiO_2 nanoparticles. Strong plasmon peaks manifest the contribution of CuO nanoparticles. Further, CuO acts as an energy sink, lowering the photoluminescence emission intensity. TiO_2 nanoparticles act as the point of energy direction convergence and amplify the photoluminescence emission intensity. The synergy between CuO and TiO_2 nanoparticles in tuning the absorption and emission features of the current glass composition could be useful for developing photonic devices.